

Rosellas, *Platycercus* spp., and their hybrids in the eastern Queensland-New South Wales border region.

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ABSTRACT

The results of a survey conducted within the Gold Coast hinterland and far northern N.S.W. region showed that while Eastern Rosellas (*Platycercus eximius*) and Pale-headed Rosellas (*P. adscitus*) were common, Crimson Rosellas (*P. elegans*) were relatively uncommon and largely restricted to more heavily vegetated habitats. The distribution of Eastern and Pale-headed Rosellas in timbered farmlands showed overlap; Pale-headed Rosellas were somewhat more common in urban areas than Eastern Rosellas. Mixed flocks of the two species were rare, but nearly 4% of sightings included hybrids between these species. The significance of hybridization between the species is discussed.

INTRODUCTION

In southeastern Queensland and northeastern N.S.W. the distributions of three rosella species overlap. They are the Crimson Rosella (*Platycercus elegans*), the Eastern Rosella (*P. eximius*) and the Pale-headed Rosella (*P. adscitus*). The Crimson Rosella which ranges from the Atherton Tableland in northern Queensland to southeastern South Australia is typically found in humid and semi-humid coastal forests including rainforests and sclerophyll forests; and may replace the Eastern Rosella at higher altitudes and in more heavily forested areas. The Eastern Rosella is found normally in savanna woodland and farming areas in southeastern Australia from southeastern Queensland to southeastern South Australia and Tasmania; the Pale-headed Rosella occurs in northeastern Australia from Cape York Peninsula to northern N.S.W. in lowland savanna woodland and sparsely timbered farmlands (Forshaw, 1969).

Hybrids between Crimson and Eastern Rosellas appear to be rare (Rogan, 1966; Courtney, 1967) while hybridization between the Eastern and Pale-headed Rosellas, although uncommon, has been reported (Brereton & Sourry, 1959; Keast,

1961; Forshaw, 1969). Indeed Keast (1961) suggested that the ecological relationship between these latter two morphologically distinct but closely related species was unclear. Certainly the habitat requirements of the two species appear to be similar although there is evidence of significant differences in their feeding biology (Cannon, 1981).

This paper presents the results of a survey conducted within the Gold Coast hinterland and far north eastern N.S.W. region which is an area where the ranges of all three rosella species overlap. Particular attention was paid to areas where both Eastern and Pale-headed Rosellas occurred and to their hybridization.

MATERIALS AND METHODS

Seven bi-monthly surveys were conducted from March 1978 to April 1979 from Surfers Paradise in Queensland in the north to Kingscliffe in N.S.W. in the south, and up to approximately 23 km inland from the coast. Approximately 400 km were traversed by car during each survey involving 200 survey points at about 2 km intervals (the same sampling sites were used on successive surveys — within 50 m). Sufficient time was spent at each stop to detect whether rosellas were present, usually about 10 minutes; the number and species of birds (where possible) and a brief habitat description was recorded. Where two or more species were seen within 1 km of each other, particular attention was paid to plumage to check for hybridization. Confusion can arise in differentiating between juvenile Pale-headed Rosellas and hybrids between Pale-headed Rosellas and Eastern Rosellas, particularly with regard to the extent of red suffusion on the crown. Hybrids were recognised as either birds having a general Eastern Rosella appearance but lacking the red on the head or breast, or birds resembling a Pale-headed Rosella but possessing red markings on the head far more extensive than typically found in juvenile birds and/or the presence of red on the upper breast. Birds were accepted as hybrids if they lacked the usual plumage characters of either the Pale-headed or Eastern Rosella, or had a mosaic of plumage features.

Using both aerial photographs (Murwillumbah series I-IV, 9541, 1975; Queensland Department of Mapping and Surveying) and the vegetation map of McDonald & Whitman (1979) a simplified habitat map of the survey area was prepared. Three broad habitats were recognised (a) urban development, (b) agricultural land and (c) forest areas. The first two habitats comprise disturbed areas where vegetation had been cleared or substantially modified. These habitats ranged from totally cleared areas (such as canal development) to areas with scattered vegetation, essentially open woodland communities. The last category, forest areas, are mainly open-forest comprising *Eucalyptus* communities, but with very limited amounts of tall-closed forest, and littoral or mangrove vegetation (see McDonald & Whitman, 1979 for greater details).

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RESULTS

During the survey a total of 1517 stops were made, 420 (27.7%) in urban areas, 944 (62.2%) in open agricultural areas and 153 (10.1%) in forested areas (see Table 1). Thus nearly 90% of the surveyed area consisted of habitats altered by man in varying amounts. Crimson Rosellas were relatively uncommon, being recorded in only 26 of the 1517 stops; 69.3% of these observations were recorded in forest areas. Crimson Rosellas were located mainly at the heads of the Bonogin, Tallebudgera and Currumbin Creek systems in Queensland, near Mt. Tomewin and to restricted areas of forest in northern N.S.W. No Crimson Rosellas were seen in urban areas and only 31% of sightings of this species were in open agricultural areas.

TABLE 1. The distribution of spot sightings of rosellas (including single species flocks, mixed species flocks and mixed or single species flocks with hybrids) in three habitats in southeastern Queensland and northeastern N.S.W. between March 1978 and April 1979.

	Habitat type			Total N
	Urban	Agricultural	Forest	
Total No. of stops in each habitat	420	944	153	1517
% of total stops in each habitat	27.7	62.2	10.1	
No. of stops where Eastern Rosellas recorded	1	71	9	81
% of total Eastern Rosella sightings	1.2	87.7	11.1	
No. of stops where Pale-headed Rosellas recorded	15	92	15	122
% of total Pale-headed Rosella sightings	12.3	75.4	12.3	
No. of stops where Crimson Rosellas recorded	0	8	18	26
% of Crimson Rosella sightings	0.0	30.8	69.2	

Eastern and Pale-headed Rosellas were sighted more frequently, particularly in open agricultural areas, rarely in urban areas, although 12.3% of Pale-headed Rosella sightings were in urban areas around Currumbin and Burleigh in Queensland and Tweed Heads West in N.S.W. Both species were typically seen inland from the immediate coastal area, the Pale-headed Rosella being more common in the northern part of the survey area and the Eastern Rosella in the extreme south. The Pale-headed Rosella was the most common of the three species (Table 2) and each species was generally sighted separately, usually alone or as a pair. The means and ranges of bird numbers of single species sightings are as follows:

Crimson Rosella 1.8 ± 1.7 (range 1-9, $N = 24$), Eastern Rosella 1.9 ± 0.9 (range 1-6, $N = 59$) and Pale-headed Rosella 1.7 ± 0.8 (range 1-7, $N = 100$).

Eastern and Pale-headed Rosellas were seen in the same general area (defined as within 200 m) at the same time more frequently than the other species combinations. However a mixed flock of these two species without hybrids was only seen once. More commonly there were areas where two or more species were seen but at different times. Given that rosellas are reasonably sedentary (Brereton, 1971 a, b) the occurrence of rosellas within the same area was defined as observations recorded within 1 km². To assess how frequently Eastern and Pale-headed Rosellas were recorded within the same area a grid system of 1 km squares was superimposed on a distribution map of the two species employing the Transverse Mercator Projection (Zone 56, Australian National Spheroid). Figure 1 shows schematically the presence (but not the number of observations) of Eastern and Pale-headed Rosellas within this grid system. Pale-headed Rosellas were recorded alone in 36 of the 93 squares (38.7%) within which birds were recorded in the grid system, the Eastern Rosella alone in 22 squares (23.7%) and both species together in 27 (29.0%) of squares. Mixed species groups with hybrids occurred in only 5 of the squares (5.4%), Eastern Rosellas with hybrids in 1 square (1.1%), Pale-headed Rosellas with hybrids in 1 square (1.1%) and hybrids alone in 1 square (1.1%).

TABLE 2. Sightings of rosella species in southeastern Queensland and northeastern N.S.W. from March 1978 to April 1979 summarised from each spot sighting survey during the seven bi-monthly surveys.

	Species	No. of sightings	%	No. of sightings	%
Single species sightings	Eastern	59	28.2	183	87.6
	Pale-headed	100	47.8		
	Crimson	24	11.4		
Two species seen at same time within 200 m but not in the same flock*	Eastern + Pale-headed	15	7.2	17	8.1
	Eastern + Crimson	1	0.5		
	Pale-headed + Crimson	1	0.5		
Two species seen within the same flock	Eastern + Pale-headed	1	0.5	1	0.5
Hybrid sightings	Eastern + Pale-headed + hybrid	4	1.9	8	3.8
	Eastern + hybrid	1	0.5		
	Pale-headed + hybrid	1	0.5		
	Hybrid alone	2	1.0		
Total		209		209	

* Grouping of birds in this group as one observation accounts for the difference in total number of records given in this Table when compared with Table 1.

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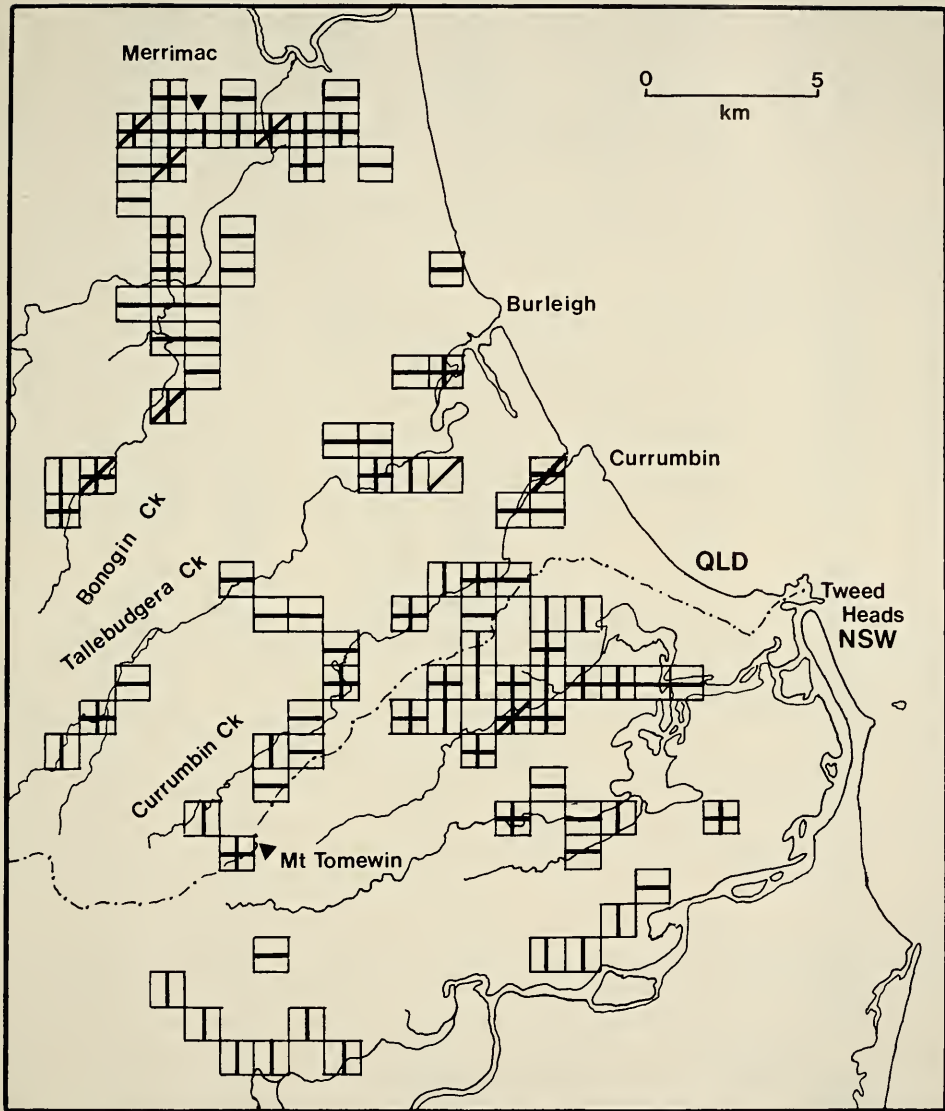


Fig. 1. Presence of Eastern Rosellas (vertical lines), Pale-headed Rosellas (horizontal lines) and their hybrids (diagonal lines) within one square kilometre grids in the Queensland-N.S.W. border region (border shown as dotted line). Crimson Rosellas not shown since no hybrids between this species and either of the other two species were seen.

TABLE 3. Sightings of Eastern Rosellas (ER), Pale-headed Rosellas (PHR) and Eastern x Pale-headed Rosella hybrids (ER/PHR) in southeastern and northeastern N.S.W. showing hybrid species associations.

Type of assoc.	Date of sighting	Total No. birds	No. hybrids	No. ER	No. PHR	Area	Activity of group	Appearance of hybrid
Mixed species	13.4.78	8	2	4	2	1.5 km WSW Merrimac Qld.	feed	like PHR with extensive red on head and breast
	13.4.78	35	+	+	+	1.8 km WSW Merrimac Qld.	feed	no detailed description several ER/PHR intermediates
	31.5.78	7	1	4	2	2 km E Merrimac Qld.	perch	like PHR with extensive red on head
With Eastern	20.7.78	5	1	3	1	Bonogin Rd. 6.5 km SSE Mudgeeraba Qld.	perch	hybrid perched close to PHR, like PHR faint red upper breast
	20.7.78	2	1	1	—	Bonogin Rd. 4 km S Mudgeeraba Qld.	perch	like ER, totally lacking red on breast
With Pale-headed	12.12.78	2	1	—	1	Palm Beach Qld.	perch	like PHR with faint red on head and upper breast, yellow lower breast, blue abdomen
Alone	13.6.78	2	2	—	—	Mt. Campbell 1 km SSE Piggabeen N.S.W.	perch	like ER dorsally, and PHR ventrally, extensive red on head
	11.5.79	1	1	—	—	Guineas Ck. Rd. 4 km W Currumbin Qld.	perch	like ER but lacking red on breast, blue/green breast and abdomen

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Of the 209 stops where rosellas were recorded during the survey eight or 3.8% included birds recognized as hybrids between Eastern and Pale-headed Rosellas (Table 3). Four of these observations included mixed species groups with at least one recognizable hybrid bird. One such group was a particularly large one for rosellas, consisting of approximately 35 birds sighted near Merrimac, some 6 to 7 km west of Broadbeach Queensland, on 13 April 1978 (the exact numbers of each species in the group could not be determined).

Within the area around Merrimac, two other hybrid groups were located at different times. Both Eastern and Pale-headed Rosellas were recorded consistently in this area throughout the survey period. Similarly both species were recorded in one of the other areas where hybrids were seen, namely Bonogin Creek. The remaining sightings of hybrids consisted of either hybrids seen alone or in the company of either Pale-headed or Eastern Rosellas. One hybrid was seen with an Eastern Rosella in the area of Bonogin Creek Queensland and one hybrid with a Pale-headed Rosella in the Palm Beach area of Queensland. The remaining two sightings of hybrids were of birds on their own. Two hybrids were seen in the Mount Campbell region of N.S.W. and a solitary bird near Currumbin in Queensland. In all cases hybrid birds were seen in open agricultural land.

DISCUSSION

Within the three habitats surveyed in southeastern Queensland and north-eastern N.S.W., Eastern and Pale-headed Rosellas were reasonably common, particularly in open agricultural areas. Crimson Rosellas were largely restricted to the forested areas which only comprised just over 10% of the habitats surveyed. This type of habitat is not as plentiful as the open agricultural areas in the region. Cain (1955) indicated that the range of the Crimson Rosella was probably more widespread in the past but long term climatic changes towards increased aridity (as well as more recent man-made alterations to the environment) have resulted in its range being restricted.

Eastern and Pale-headed Rosellas within the survey area were more common in 'open field' habitats created by land clearance. Keast (1961) suggested that, in contrast to the Crimson Rosella, the Eastern and Pale-headed Rosellas have probably extended their ranges as a result of man-made alterations to the environment until these two species now overlap. Certainly there was considerable habitat overlap between the Eastern and Pale-headed Rosellas in the survey area, to the extent that both species were recorded in the same area in over one third of cases (although birds were not frequently seen at the same time).

There is strong evidence that these two species are ecologically segregated, at least in some aspects of their feeding biology (Cannon, 1981), but the common occurrence of both species in the same area does indicate that the potential for interbreeding exists. Even though mixed species flocks were rare, nearly 4% of

flock sightings did include birds which were recognised as hybrids. The occurrence of wild hybrids (although not common), in areas where the ranges of the Eastern and Pale-headed Rosellas overlap, has been reported previously (see Keast, 1961; Forshaw, 1969). Short (1969) defined hybridization as the interbreeding of individuals of morphologically (and therefore presumably genetically) distinct populations, regardless of the taxonomic status of such populations. Using Short's criteria, the example of the Eastern and Pale-headed Rosellas is one of a zone of overlap and hybridization, rather than a hybrid zone *per se* where only hybrids occur. This zone of overlap probably results from secondary contact of the two species (Keast, 1961). The presence of hybrids in the wild, albeit rare, would indicate an incomplete development of isolating mechanisms (Ford, 1974). Members of the *Platycercus* genus hybridize readily in captivity (Forshaw, 1969). Eastern and Crimson Rosellas very rarely hybridize naturally (see Rogan, 1966; Courtney, 1967). This is probably because their habitat requirements are dissimilar, this being unlike the Eastern and Pale-headed Rosella in which their preferred habitats are similar.

Since the pair-bond of rosellas appears to be quite stable it must be assumed that mixed species pairs are formed within mixed species flocks (Brereton, 1971 a, b). Brereton (1971 b) indicated that pair formation of Eastern Rosellas occurs within small groups of 4 to 6 immature birds. These groups can form larger flocks during autumn and winter when they are less sedentary than pairs of breeding adults. The only large mixed species group of rosellas in the survey area was seen in autumn; most rosellas were sighted alone or as a pair. The opportunities, therefore, for mixed species pairs to form would be limited, despite the apparent considerable overlap of Eastern and Pale-headed Rosellas in the area.

Brereton & Sourry (1959) reported that the distribution of Eastern and Crimson Rosellas overlapped in the New England district of N.S.W. but mixed species flocks were very rare.

Nonetheless since the Pale-headed and Eastern Rosellas ranges overlap in south eastern Queensland and north eastern N.S.W. it is highly likely that mixed species flocks and even pockets of hybridization occur throughout this region. It would be interesting to continue to document the occurrence of such hybrids since they may prove to be more common than earlier evidence would indicate.

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